
INCIDENT OVERVIEW: MAHABIR COLLIERY DISASTER

Md Rustam*¹, Dinkar Narayan².

Research Scholar at Mewar University¹,
Assistant Professor at Mewar University².

Article Received: 09 April 2026, Article Revised: 29 April 2026, Published on: 19 May 2026

***Corresponding Author: Md Rustam**

Research Scholar at Mewar University.

DOI: <https://doi-doi.org/101555/ijarp.3156>

ABSTRACT:

Through the perspective of the Mahabir Colliery tragedy, a major event in the mining sector, this study investigates the important features of mine safety. Emphasizing the need of strong safety measures, emergency preparedness, and efficient risk management, the study concentrates on the causes, effects, and response plans connected to the tragedy. This study seeks to help the continuing efforts to improve mining sector safety standards by examining the difficulties encountered during the rescue operation and the role of technical interventions.

- 1. Overview of Incident:** On November 13, 1989, under Eastern Coalfields Limited in the Raniganj Coalfield, the Mahabir Colliery Disaster happened.
- 2. Characteristic of Occurrence:** Mine flooding brought about major rescue operations.

Emphasizes how absolutely necessary strong safety regulations are in coal mining activities.

1. Implications for Mining Safety:

- Adherence to safety protocols is crucial.
- Emergency preparedness and regular training are essential.
- Continuous risk management in mining operations is necessary.
- Learning from the Disaster: The incident serves as a lesson for enhancing safety standards in the mining industry to protect miners' lives.

KEYWORDS: Mahabir Colliery Tragedy; Mining Safety; Coal Mining; Mine Flooding; Emergency Preparedness; Risk Management Safety Rules; Raniganj Coalfield; Eastern Coalfields Limited; Mining Accidents.

INTRODUCTION

The past of worldwide industrial activity has been greatly shaped by mining calamities. By nature dangerous, the mining industry calls for rigorous safety precautions and consistent development of operational methods. The Mahabir Colliery Disaster, caused by inundation, is one well-known event that underscored the need of coal mining safety since it had major consequences on mining safety procedures. With an emphasis on its consequences for improving safety standards in the mining sector, this work seeks to offer a thorough study of the causes, effects, and lessons drawn from the Mahabir Colliery Disaster. On November 13, 1989, the Mahabir Colliery Disaster struck. Key ideas derived from the case study in the International Journal of Research in Engineering, Science and Management are - Eastern Coalfields Limited's Mahabir colliery in the Raniganj Coalfield experienced the catastrophe. There was a mine flooding incident in it. Six-five people were saved; 06 died.

An explosion during mining activities inadvertently pierced a wall next to a flooded, deserted older mine (probably the Ningah seam or an old working of the upper Nega seam). losses of casualties Six people died. miners caught Cut off by the gushing water, 65 miners were trapped underground. Save Mr. Jaswant Singh Gill, at the time Additional Chief Mining Engineer for Coal India Limited. Technique of Rescue Especially made, a steel rescue capsule was descended down a just drilled, huge bore hole. Then one at a time the trapped miners were lifted out. Significance Amazing accomplishment, the rescue of 65 miners from a borehole employing a capsule set a new global record of its kind in mining history. Considered a classic case of bravery and fast engineering, the Rescue Operation was a battle against time. To communicate with the trapped miners and send down food and water, initial little boreholes were sunk. Using available steel sheets, Mr. Jaswant Singh Gill created and modified a rescue capsule. The capsule was housed in a shaft with a wider diameter. Mr. Gill personally volunteered and was lowered into the flooded mine in the capsule to supervise the rescue and bring the miners up one by one. The outcome of an effort spanning several days was the safe evacuation of all sixty-five trapped miners.

1. Disaster evaluation:

- Investigate potential water infiltration sources, mine planning, and safety loopholes as causes of the catastrophe.
- Discuss emotional trauma, loss, sorrow, and socioeconomic consequences on miners and their families.

- Examine rescue missions, obstacles, and possibilities for mitigation for response and rescue efforts.
- Assess protocol appropriateness, adherence, and necessary modifications regarding safety policies and procedures.

2. Answer and rescue mission:

Several important actions were undertaken in the Mahabir Colliery tragedy to rescue the trapped miners. Among the important components of the operation are:

1. Immediate Response: Start of rescue efforts to find and free stranded miners.
 2. Efforts to manage water levels in the mine to help rescue operations
 3. Coordinating and Planning: Effective execution of the rescue plan depends on cooperation across mine management, rescue teams, and government.
 4. Execution of safety procedures to guard the imprisoned miners as well as the rescue teams.
- The success of the rescue mission relied on the efficiency of these procedures and the difficulties encountered, including control of water inflow and safety of both the miners and the rescue crew.

3. Implications of safety for coal mining

security Mahabir Colliery Disaster Consequences and Interventions

The catastrophe at the Mahabir Colliery emphasizes important safety issues that have to be fixed to avoid future similar occurrences. Important points follow:

- ✓ **Risk of water infiltration:** Mines need strong systems to control and stop water infiltration, which might result in devastating floods.
- ✓ **Emergency Preparation:** Regular drills and good emergency response planning are absolutely vital to guarantee miners' quick and safe evacuation.
- ✓ **Evaluating Hazards:** Regular risk evaluations and monitoring can help spot possible dangers and stop mishaps.
- ✓ **Early detection of water** infiltration and other risks may be achieved by real-time monitoring system adoption.
- ✓ **Constant Practice:** Giving miners and rescue teams consistent training will improve reaction times and efficiency.
- ✓ **Safety guidelines:** Creating and enforcing tight safety measures can help to guarantee a safe working environment and lower accident risk.

4. Recommendations

- ✓ **Proactive Safety Actions:** Applying preventative safety precautions guarantees a safe workplace and so helps to avoid mishaps.
- ✓ **Regular inspection and revision** of safety rules and guidelines helps to guarantee their continuing efficiency.
- ✓ **Exchange of Knowledge and Cooperation:** Across the sector, sharing knowledge and best practices helps raise safety norms and stop similar events.
- ✓ **Regulation:** Follow complete safety precautions and procedure of reg no. 150 of coal mine regulation 2017.

5. Considerations and Future Directions:

Studying the response and rescue operation offers ideas on the efficiency of current procedures and potential for development. Knowing the difficulties encountered during the operation will enable one to create more effective future rescue plan. For better mine safety and rescue activities, the Mahabir Colliery tragedy offers a case study. Comparing the Mahabir Colliery tragedy's response and rescue efforts with those of other comparable events will help to spot areas for improvement and best practices. Investigating the part of technology in improving the efficiency of rescue operations following mining accidents.

6. RESULTS AND CONVERSATION:

Disaster at Mahabir Colliery

One of the most instructive examples in the annals of coal mining safety in India, the Mahabir Colliery tragedy of November 13, 1989, is also among the most educational case studies. Mainly brought on by abrupt mine inundation brought on by the inadvertent breach of a water-logged abandoned working, the event happened in the Raniganj Coalfield under Eastern Coalfields Limited. This part compiles the results of the research, assesses the causes and effects of the catastrophe, and considers its more general implications for mining safety, emergency preparedness, and technical assistance.

a) Investigation of the Event

The calamity started when mining activities unintentionally pierced a barrier separating current workings from an ancient, water-filled mine. This caused six miners' deaths and trapped 65 men under as water rushed into the operating area. The incident draws attention to a serious flaw in hazard detection and mine planning.

One important conclusion is that insufficient knowledge of ancient mine workings and poor

geological mapping affected the occurrence of the catastrophe rather than it being completely unintentional. During planning phases, the existence of waterlogged abandoned seams, such as the Ningah seam or upper Nega seam, ought to have been noted and taken into account. The catastrophe was substantially caused by the absence of correct mine records and inadequate preventive drilling.

Furthermore, not keeping appropriate barrier thickness between operational and deserted flooded areas constitutes a break of basic mining safety rules. This stresses the need of continuous monitoring of mine conditions and perfect adherence to safety rules.

b) Socio-economic and human consequences

The catastrophe had great human effects. The loss of six lives had enduring emotional and economic ramifications for the bereaved families even if the rescue of 65 miners was a stunning success.

The psychological trauma experienced by the trapped miners cannot be understated. Confined underground with rising flood levels caused great anxiety and dread. Survivors probably had post-traumatic stress and anxiety, among other long-term mental health issues.

Financial instability and emotional anguish resulted from the catastrophe for the families of the deceased. In mining towns, where job prospects are few, the loss of a breadwinner can have terrible long-term effects. This emphasizes how urgently the mining industry requires better social support networks and stronger compensation systems.

c) Evaluating rescue efforts

One of the most important effects of the Mahabir Colliery tragedy was the extremely successful rescue effort directed by Jaswant Singh Gill, Additional Chief Mining Engineer of Coal India Limited. In mining history, the rescue operation is generally seen as a turning point accomplishment.

d) Engineering Excellence and Innovation

The rescue mission included the creative employment of a specially built steel capsule lowered via a wide-diameter borehole dug from the surface. Unprecedented then, this technique showed remarkable engineering creativity.

First boreholes were dug to provide oxygen, water, and nourishment to the trapped miners and enable communication with them. Once communication was made, a bigger borehole was bored to help rescue vehicle. Leading and bravery are shown

in Gill's choice to physically enter the mine to arrange the evacuation.

Over many days, the operation saved all 65 stranded miners, therefore establishing a global record for such rescue missions.

e) Problems Encountered

- The rescue mission had several obstacles despite its success:
- The mine's stability was jeopardized by ongoing water inflow.
- Keeping in touch with imprisoned miners presented challenges.
- Precision and time were needed in drilling a wide-diameter bore.
- A continuous worry was making sure rescuers were safe.
- These difficulties emphasize the value of better planning and pre-established emergency response systems.

f) Safety Consequences

The disaster exposed several major flaws in mining safety procedures and offered insightful lessons for future activities.

g) Water ingress control

The primary cause of the disaster—water inundation—emphasizes the importance of robust water management systems. Mines have to put in:

- Advanced hydrogeological investigations
- Periodic checking of water levels
- Preventive drilling finds bodies of water.
- Failure to solve issues related to water ingress could have terrible results, as shown in this instance.

h) Readiness for Emergencies

Rapid decision-making and improvisation were mostly responsible for the success of the rescue effort. Reliance on improvisation, though, points to a dearth of organized emergency readiness. Frequent emergency drills, well-defined evacuation procedures, and readily available specialist rescue equipment are vital. Dedicated rescue teams trained for several disaster situations should also be created by mines.

i) Risk Management and Monitoring

The catastrophe emphasizes the need of ongoing risk analysis. Mines have to take on:

- Real-time monitoring tools
- Procedures for hazard recognition
- Regular safety evaluations
- Technological innovations like sensors and automated alerting systems can greatly lower dangers.

j) Education and Awareness

Frequent training of mining personnel and supervisory personnel is vital. Workers should be taught possible risks as well as emergency response protocols. To increase readiness, training courses ought to include simulated activities.

k) Legislative Compliance

Strict observance of mining rules is imperative. The study stresses adherence with rules including Regulation 150 of the Coal Mine Regulations, 2017 . Regulatory agencies need to guarantee enforcement by means of inspections and punishments for violations.

l) Technological Solutions

- ✓ The Mahabir catastrophe showed how technology could be used in rescue efforts. A great development was marked by borehole drilling and rescue pods.
- ✓ Modern mining projects would gain even more from:
- ✓ Technologies for distance detection
- ✓ Automated drilling technologies networks of real-time communication
- ✓ Artificial intelligence for risk forecast
- ✓ Incorporation of such technologies improves both response and prevention skills.

m) Comparisons and Insights

The Mahabir Colliery event stands out for its effective rescue effort when compared to other mining catastrophes. Although several mining accidents lead to great fatalities owing to delayed reaction, this case shows how prompt assistance can save lives.

n) Important comparative discoveries include:

- Faster reaction times dramatically increase survival rates.
- In an emergency, innovation becomes very important.

- For great results, good coordination and leadership are absolutely necessary.
- These ideas can guide worldwide best mining safety procedures.
- Lessons Learned
- There are many significant lessons from the Mahabir Colliery tragedy:
- Correct mine mapping is vital.
- Inadequate knowledge of former operations can cause deadly mistakes.
- Better than reactive remedies are preventative steps.
- Good risk assessment and planning can help to avert catastrophes.
- Emergency Ready Saves Lives
- Important are organized reply systems.
- Technology improves safety.
- Adopt contemporary tools might help to lower risks.
- Human Components Count
- Managing crises depends critically on leadership, collaboration, and bravery.

o) Further Roads

- The results of this study point toward several paths to raise mining safety:
- Development of comprehensive safety management systems
- More research and development funding
- Better legal systems.
- Encouraging knowledge transfer throughout the sector
- Future studies should concentrate on examining comparable events to find trends and create predictive models for risk reduction.

7. CONCLUSION

The Mahabir Colliery accident emphasizes the vital need of safety in the mining sector. It emphasizes the quick thinking and courage of the rescue crew and provides a crucial lesson in emergency preparedness and reaction. The sector should give strong safety measures—including thorough risk assessment and management—first priority to avoid comparable events. The mining industry can minimize hazards and guarantee a safer workplace by drawing knowledge from past events and following proactive safety measures. Constant knowledge sharing and improvement are essential to raising safety regulations and avoiding next catastrophes. The Mahabir Colliery tragedy should guide and propel safety initiatives in the mining sector. The

Mahabir Colliery tragedy is both inspiration and caution. Although it showed major flaws in mining safety procedures, it also showed how creativity, leadership, and concerted effort may save lives. The remarkable rescue of sixty-five miners serves as evidence of human resilience and inventiveness. The loss of six lives, meanwhile, makes us aware of the high dangers related to mining activity.

Learning from this event and putting strong safety protocols into practice will enable the mining sector to progress toward a safer and more environmentally friendly future.

8. REFERENCES

1. D. J. Deshmukh, "Elements of Mining technology," volume 2, A unit of central techno publications, Nagpur.
2. Mine Rescue Rule, 1985.
3. Riyajuddin Ansari, Case Study on Mahabir Colliery Disaster on 13.11.1989, International Journal of Research in Engineering, Science and Management Volume 6
4. Singh, R. D. *Principles and Practices of Modern Coal Mining*. New Age International.
5. Hartman, H. L. *Introductory Mining Engineering*. Wiley.
6. Das, S. K. *Mine Safety Management*. Lovely Prakashan.
7. Peng, S. S. *Coal Mine Ground Control*. Wiley.
8. McPherson, M. J. *Subsurface Ventilation and Environmental Engineering*. Springer.
9. Mishra, D. P. (2015). "Analysis of Indian Coal Mine Accidents." *Safety Science*.
10. Saxena, N. C. (2003). "Mine Disasters in India." *Indian Mining Journal*.
11. Prasad, G. M. "Major Mining Disasters in India." DGMS Report.
12. Sengupta, M. "Flooding Hazards in Underground Mines."
13. Chaudhuri, S. "Lessons from Coal Mine Inundation Accidents."
14. Singh, T. N. "Hydrogeological Hazards in Coal Mines."
15. Younger, P. L. *Mine Water: Hydrology, Pollution, Remediation*. Springer.
16. Kumar, P. "Mine Inundation Risk Assessment."
17. ISRM (International Society for Rock Mechanics) – Water Ingress Reports.
18. DGMS Circular on Inundation Hazards (India).
19. Gill, J. S. (Case documentation on Mahabir rescue operation).
20. Singh, B. "Mine Rescue Operations in India."
21. International Labour Organization (ILO). *Safety and Health in Mines Convention*.
22. National Institute of Miners' Health (NIMH) Reports.
23. Mine Safety and Health Administration (MSHA, USA) – Rescue Guidelines.

24. ISO 45001: Occupational Health and Safety Management Systems.
25. ISO 31000: Risk Management Guidelines.
26. Karmis, M. "Risk Assessment in Mining Industry."
27. Reason, J. *Human Error*. Cambridge University Press.
28. Heinrich, H. W. *Industrial Accident Prevention*.
29. Coal Mines Regulations, 2017 (India).
30. Mines Act, 1952 (India).
31. Directorate General of Mines Safety (DGMS) Manuals.
32. Coal India Limited Safety Guidelines Coal India Limited
33. Eastern Coalfields Limited Safety Reports Eastern Coalfields Limited
34. Chugh, Y. P. "Automation in Underground Mining."
35. Brady, B. & Brown, E. *Rock Mechanics for Underground Mining*.
36. Remote Sensing Applications in Mining Safety – ISRO Publications.
37. IoT-based Mine Monitoring Systems (IEEE Papers).
38. Real-time Gas Monitoring Systems – Mining Technology Journal.
39. Bell, F. G. *Environmental Impacts of Mining*.
40. Sharma, S. "Socio-economic Impact of Mining Disasters."
41. World Bank Report on Mining and Communities.
42. ILO Reports on Worker Safety in Hazardous Industries.
43. Health Impacts of Mining – WHO Publications.
44. Courrières Mine Disaster (France, 1906) studies.
45. Benxihu Colliery Disaster (China, 1942) reports.
46. Chasnala Mining Disaster (India, 1975) case study.
47. Upper Big Branch Mine Disaster (USA, 2010) investigation report.
48. Pike River Mine Disaster (New Zealand, 2010) report.
49. *International Journal of Mining Science and Technology*.
50. *Safety Science Journal (Elsevier)*.
51. *Journal of Sustainable Mining*.
52. *Mining Engineering Journal (SME)*.
53. *International Journal of Rock Mechanics and Mining Sciences*.